TStnSVF Mistag Asymmetry

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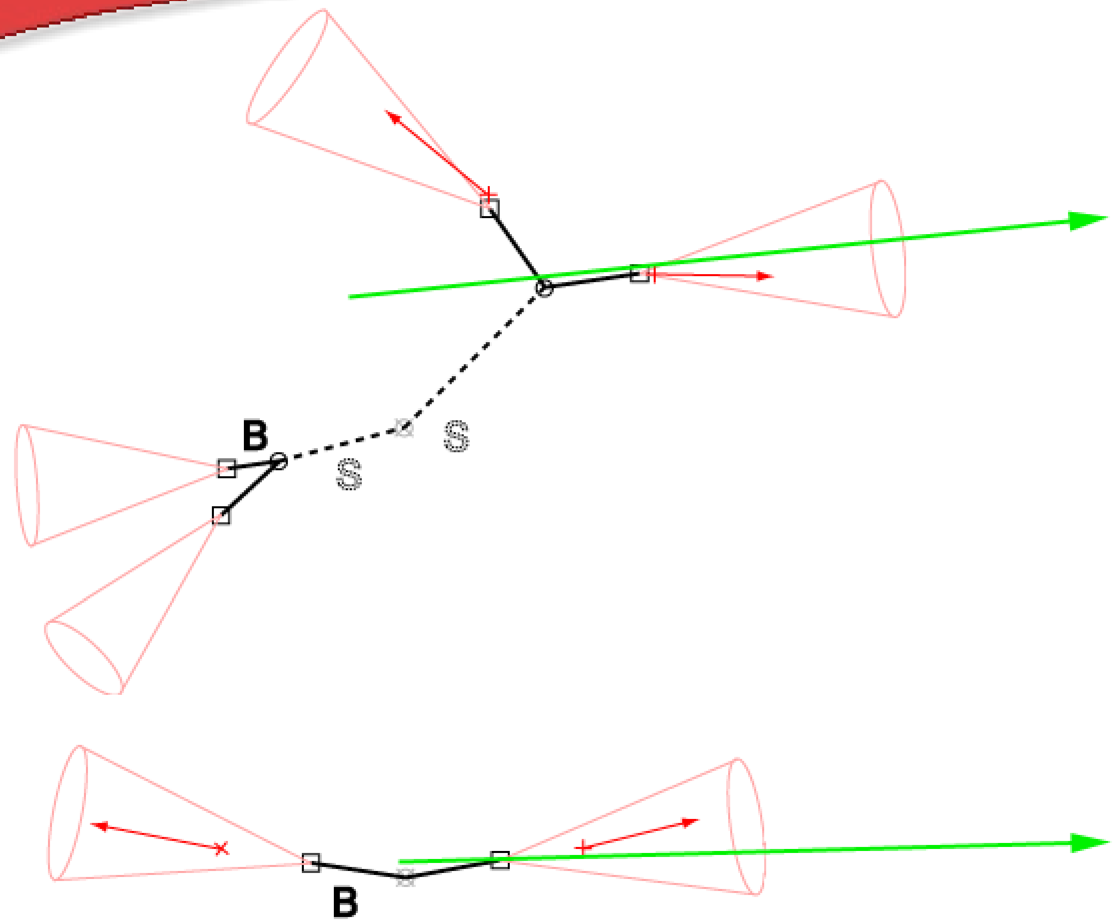
Introduction

- Mistag Asymmtry Analysis
  - Description
  - Data and Templates
  - Results

Motivation – My Analysis



Top diagram - Signal
H_0->a_0,a_0->bbbar,bbbar
with A0 cτ ~ 1 cm

Bottom diagram - Bkgd
QCD dijet bbbar

- Top diagram is the signal, bottom diagram is a typical dijet bbbar event.
- Primary vertex is the gray X inscribed in a circle.
  - The a_0 (S) is a heavy pseudo-scalar from the Hidden-Valley model.
- A d0 cut on a track (in green) would remove tracks from any signal.

Description

- Mistag asymmetry is a measurement of the asymmetry in negative tagged jets.
  - Ideally negative tagged jets would be light quark jets. But reality this doesn't happen.
  - In addition, the positive tagged light quark fraction is larger due material effects and decays of K_S and Λ.
- To correct from the negative tag rate to the mistag rate we calculate two variables, α and β, defined below.
  - $R^-_{mistag} = N^-_{light} + N^-_{heavy} / N^{pretag}_{light} + N^{pretag}_{heavy}$
  - $\alpha = N^+_{light} / N^-_{light} + N^-_{heavy}$
  - $\beta = N^{pretag}_{light} + N^{pretag}_{heavy} / N^{pretag}_{light}$
  - $\alpha\beta R^-_{mistag} = N^+_{light} / N^{pretag}_{light}$
  - pretag is defined as a jet which passes the fiducial E_T and η cuts.
- Thus $\alpha x \beta$ is a correction to the negative tag rate.

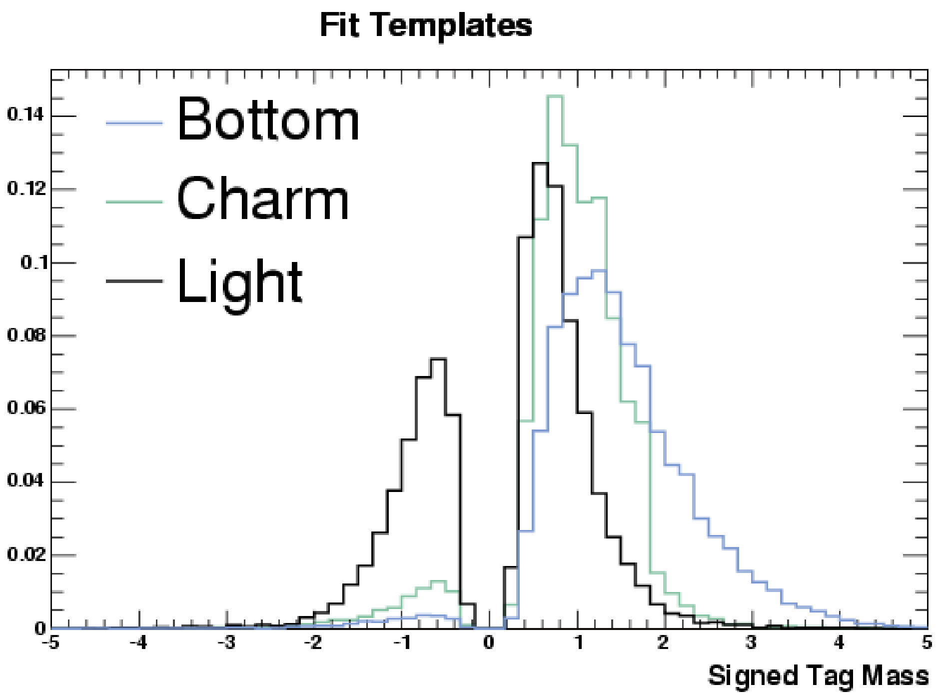
MAsym. Data

- The MAsym. analysis uses data from the four JET triggers: JET_20, JET_50, JET_70, and JET_100; periods 0-8
  - gjt10x, gjt20x, gjt30x, gjt40x
  - Where x is “d,” “h,” and part of “i.”
- The analysis also uses the four corresponding Pythia QCD dijet data samples for p_T 18, 40, 60, and 90
  - btopqb, btoprb, btopsb, btoptb
- To account for the different jet E_T turn-on between data and MC, MC events smear the leading jet E_T with a Gaussian turn on at 5 GeV below the corresponding jet sample trigger threshold with a 5 GeV width.
  - btopqb (18) was smeared with a Gaussian mean of 15 GeV (JET_20 - 5).
- The data and MC were then split into separate E_T bins.
  - E_T = 10, 22, 40, 60, 1000 GeV.
- The MC was further weighted by the relative tag fractions from the data.
  - btopqb was weighed to JET_20, etc.
  - Rel. fraction = the number of tagged jets in an E_T bin/all tagged jets from the sample.

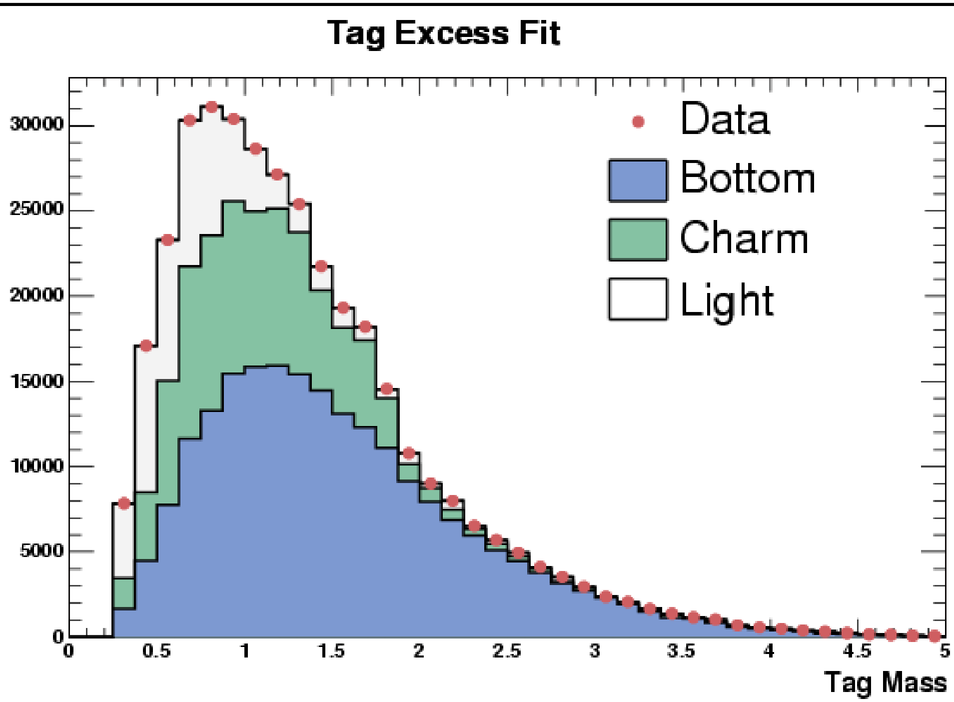
Method

- The method uses is identical to that in CDF Notes 9277 and 8626.
  - We fit the positive-negative tag excesses in b/c/l quark templates to data, using the signed vertex mass as our primary variable.
  - The b/c/l jet fractions are extracted from the fit.
  - These fractions tell us the number of b/c/l quark jets in the data distribution.
- From these quantities we calculate α and β.
  - α's numerator is the fitted number of light quark jets in the data.
  - The denominator is just the total number of (positively) tagged jets.
  - For β, we first take the fit fractions and calculate the number of pretag b/c/l jets.
    - The b/c efficiencies from MC are used, multiplied by the Scale Factor from the muon method SF analysis.
    - The error on the scale factor for charm quarks is doubled.
  - The numerator of β is the the number of pretag jets – number of bs and cs.
  - The denominator is the number of pretag jets.

Histograms



The MC templates, difference fit, and final fit for TStnSVF b-tagger tight operating point, E_T bin 22-40 GeV.



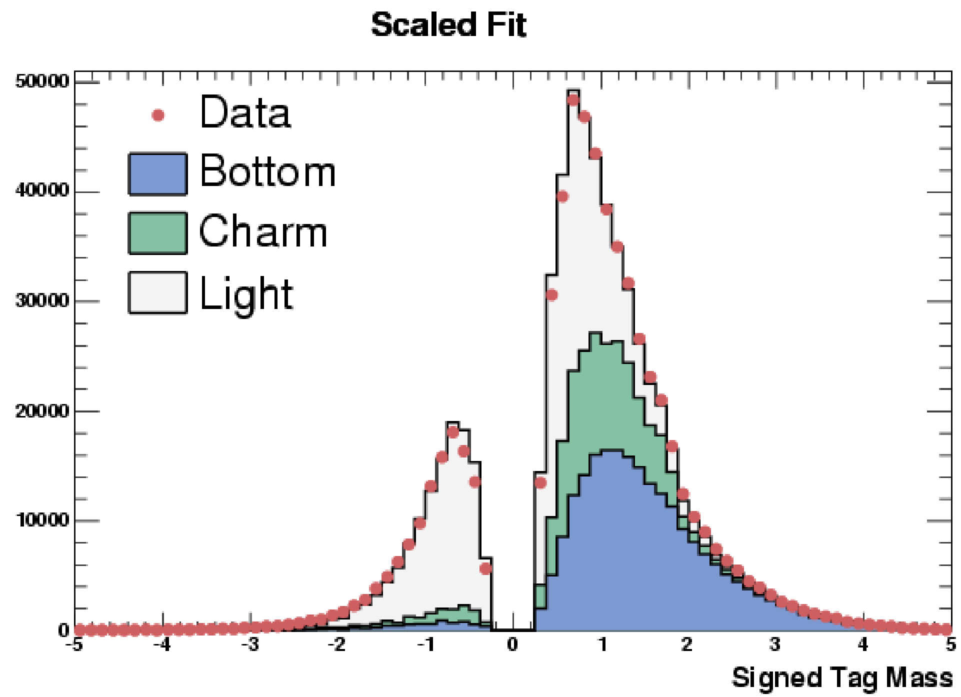
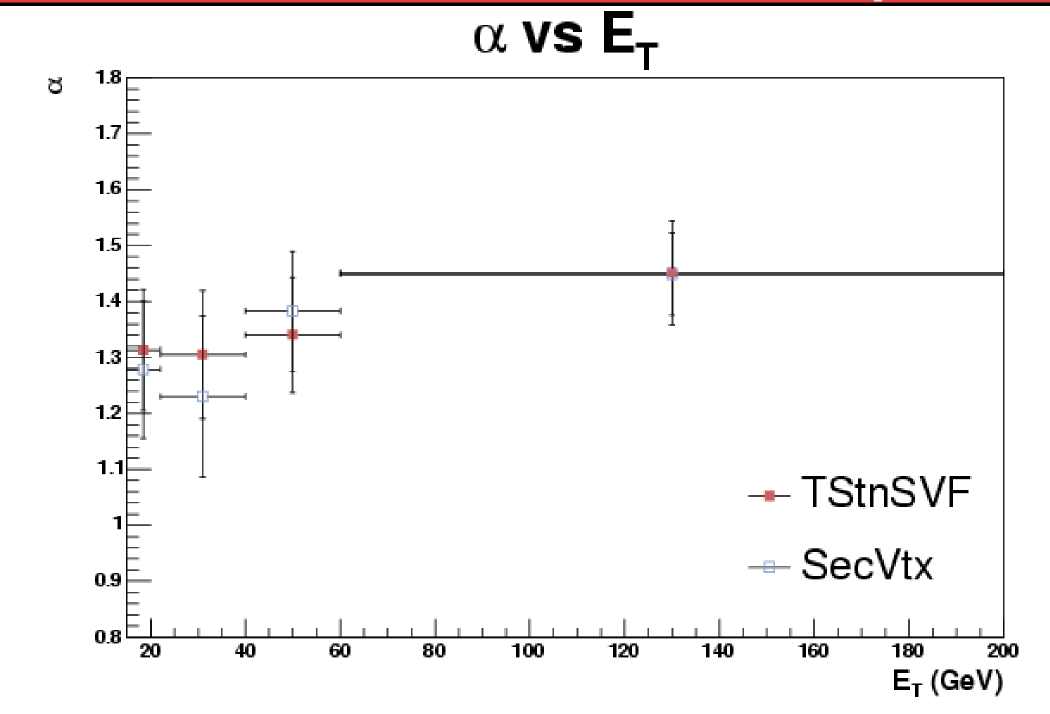


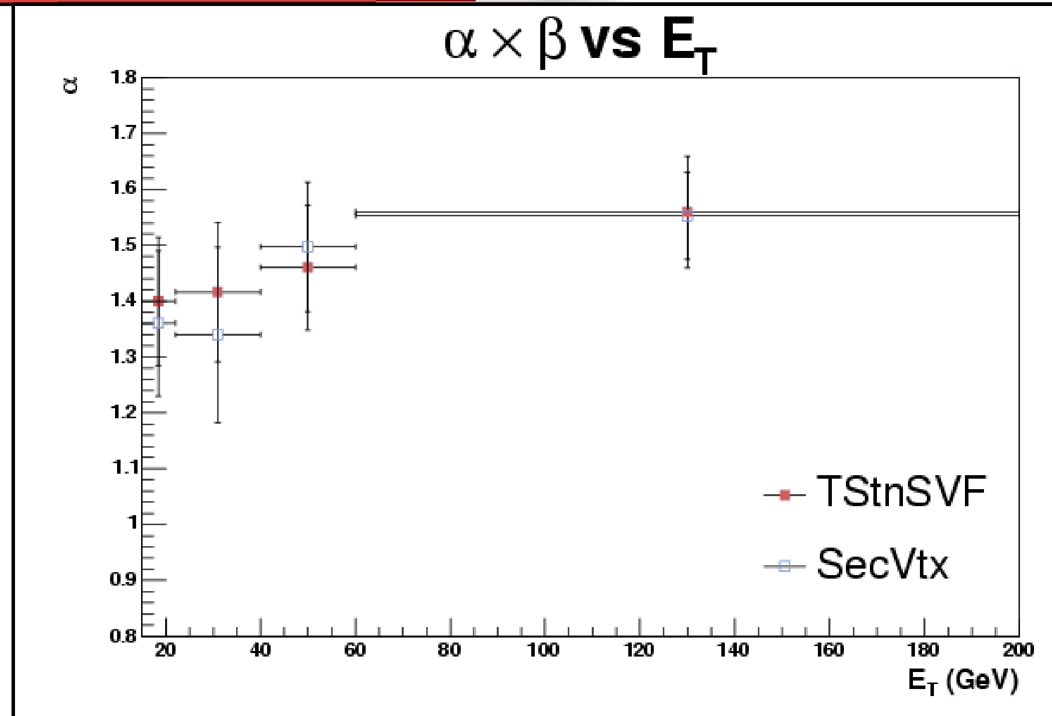
Table of Results

- Below is the final table of α and $\alpha\beta$ for both b-taggers, tight operating point.
- Error shown are statistical.

TStnSVF-tight	10-22 GeV	22-40 GeV	40-60 GeV	60-1000 GeV
α	1.314 ± 0.108	1.305 ± 0.114	1.340 ± 0.103	1.452 ± 0.093
$\alpha\beta$	1.399 ± 0.115	1.416 ± 0.124	1.460 ± 0.112	1.559 ± 0.100
SecVtx-tight				
α	1.278 ± 0.122	1.230 ± 0.144	1.383 ± 0.107	1.449 ± 0.073
$\alpha\beta$	1.360 ± 0.130	1.339 ± 0.157	1.497 ± 0.116	1.553 ± 0.078

$\alpha\beta$





α and $\alpha\beta$ as a function of E_T for both TStnSVF and SecVtx, tight operating points.

Conclusions

- Mistag Asymmetry analysis produces the same results for TStnSVF and SecVtx.

- Thanks to John F. for all his help.
- A CDF Note is in the works regarding TStnSVF and what you've seen in this presentation.
- Web page at URL:
  - http://www-cdf.fnal.gov/htbin/twiki/bin/view/ZtoBBbar/TStnSVF
  - Contains Additional Histograms and a full table of results.